PARTS & SERVICE NEWS

SUBJECT: ENGINE DATALINKS: CONNECTING TO AN ENGINE'S ECM

PURPOSE: To connect engine datalinks to electronic service tools.

APPLICATION: QSK19 Engines
QSK45/60 Engines
SA(A)12V140Z-1 & Z-2 Engines
For Specific Applications See Parts & Service News AA97079A

FAILURE CODE: A000Z9

DESCRIPTION:

This Parts & Service News provides a list of the contents of the INLINE II datalink kits. It also describes the datalink's adapters and connectors. The SAE J1939 guidelines are covered in an overview section. Connections to the ECM are covered in the final section.

INLINE II Datalink Adapter Kit Contents

INLINE II Adapter Kit, Part No. 3163094

Part No.	Description
3163095	INLINE II datalink adapter
3162847	Cable, DB25F 3-pin Deutsch/2-pin Weather-Pack
3162848	Cable, DB25F 9-pin Deutsch
3162849	Cable, 2-pin Weather-Pack - cigarette plug extension
3162850	9-Wire cable, DB9F-DB9M
3163096	Cable 3-pin to 3-pin minibackbone
3824438	Cable, DB25F 2-pin Weather-Pack/cigarette plug
3824439	Cable, DB25F 6-pin Deutsch
3162866	Case, storage
3162867	Insert, storage case
3162868	Insert, storage case
3377728	Sheet, instruction
3163597	Cable, 3-pin to 3-pin gender adapter

INLINE Deutsch Kit, Part No. 3885806

Part No.	Description
3824938	INLINE datalink adapter
3824439	Cable, DB25F 6-pin Deutsch
3824594	4-Wire cable, DB9F-DB9M

KOMATSU

The following matrix shows what version of INSITE™ (5.0 or 5.1) and what functions it can do with an INLINE II (J1939/J157/J1708) datalink adapter.

Legends for the following matrix consist of the following:
• Monitor/Read Fault Codes (MR)
• Adjust Parameters (AP)
• Calibrations Download (CD)

Engine Program	INSITE™ 5.0 (June 1998 CD-Rom)		INSITE™ 5.1 (Feb. 1999 CD-Rom)	
	INLINE J1587/ J1708 Support	INLINE II J1939 Support	INLINE J1587/ J1708 Support	INLINE II J1587/ J1708 and J1939 Support
QSK 19	MR, AP, CD		MR, AP, CD	MR, AP, CD
QSK45/60	MR, AP, CD		MR, AP, CD	MR, AP, CD
QST30		MR, AP, CD		MR, AP, CD

**Troubleshooting procedures for the INLINE II datalink adapter.**

Follow these steps after using the troubleshooting symptom tree titled "*Communication Error*" in the appropriate troubleshooting and repair manual for your specific engine family.

a. Do **not** run INSITE™ and electronic software database and network (ESDN) at the same time. Run **only** one at a time and close out the other program.
b. Select the proper datalink adapter type. If you are using INSITE™, go to the main screen and click on "System," then click "User Options," and then pick INLINE II for the datalink adapter type. Restart INSITE™ after changing the datalink adapter type. If using ESDN, go to the main screen and click on "System," then click "Preferences," and then pick INLINE II for the datalink adapter type. Restart ESDN after changing the datalink adapter type.
c. Check to see if the correct software has been installed. At the main screen of INSITE™, click on "System," then "Administrator," then "System Preferences." The particular ECM that you are working with **must** be listed under "ECM Type."
d. Inspect the datalink cable between the computer and the INLINE II datalink adapter. The INLINE II datalink adapter requires 9 pins in the connector (Part No. 3162850). Do **not** use Part No. 3824594 because it **only** has 4 pins.
e. Reset the INLINE II datalink adapter's power. Close INSITE™ or ESDN, and disconnect the power connector from the INLINE II datalink adapter. Reconnect power after a few seconds and restart INSITE™ or ESDN.
f. Make sure the red power lamp on the INLINE II datalink adapter is on continuously during operation. If it is **not** solid, then you do **not** have adequate 12-VDC supply to the adapter box.
g. Make sure the red datalink lamp on the INLINE II datalink adapter box is flashing. If it is **not** flashing, then you are **not** getting a signal from the ECM. Troubleshoot the datalink wiring.

h. When attempting to communicate, the red PC lamp on the INLINE II datalink adapter box should be flashing. If it is **not** flashing while attempting to communicate, then you are **not** getting a signal from the PC to the INLINE II adapter. Close INSITE™ or ESCN, and turn the keyswitch to the OFF position to shut off the ECM for 30 seconds. Then, turn the keyswitch to the ON position to power up the ECM and restart INSITE™ or ESCN. If you can **not** communicate, repeat step (e).

i. During a calibration download the datalink lamp and the "To PC" lamp should be flashing. The INSITE™ or ESDN screen could **not** show the hour glass but when the two lamps are flashing, the PC and ECM are communicating.

CAUTION

After the calibration download is complete, you must turn the keyswitch to the OFF position for 30 seconds or more. ECM damage could occur if this procedure is not followed.


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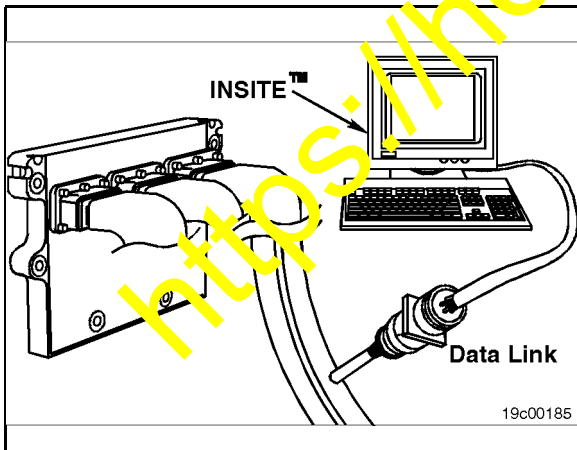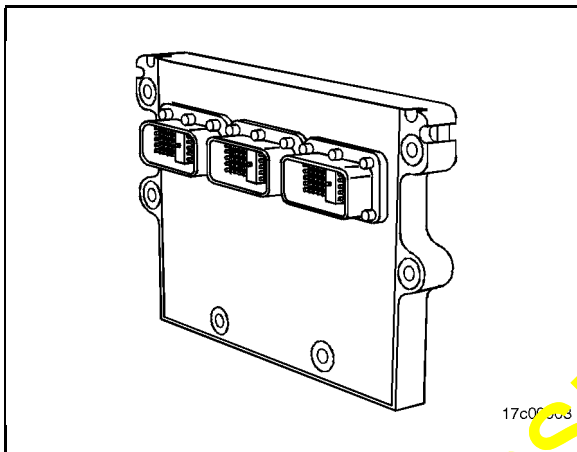
Datalinks

Many engines produced today are electronically controlled. These engines have special diagnostic requirements because of the electronic control module (ECM) in the system. To interface with these ECM's, electronic service tools have been developed, such as INSITE™.

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INSITE™ interfaces with the electronic engines by means of a datalink. A datalink provides a physical means for transmitting and sorting electric signals. A datalink consists of special electronic circuitry and electrical harnesses. Connection points for electronic service tools are also part of the datalink.

Datalinks are defined by standards written by the Society of Automotive Engineers (SAE). Two such standards for electronic service tools are used. One is a combination of SAE J1587/SAE J1708 and the other is SAE J1939. Engines can support one or both of these datalink standards.

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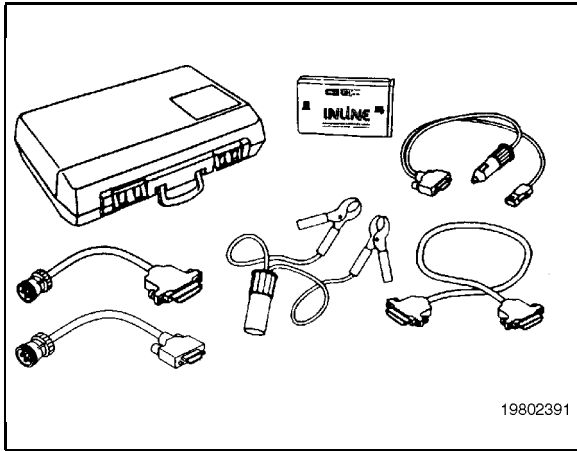
Datalink Adapters

A datalink adapter is a device that converts the SAE J1587/SAE J1708 or the SAE J1939 datalink messages from the ECM into a message that a personal computer can understand. Because INSITE™ is a personal computer-based tool, a datalink adapter is required to troubleshoot engines.

Cummins Engines' Service Products offers two datalink adapter kits: the INLINE adapter kit, Part No. 3163099; and the INLINE II adapter kit, Part No. 3163094. **The INLINE adapters translate only SAE J1587/SAE J1708 messages. INLINE II adapters translate both SAE J1587/SAE J1708 and SAE J1939 messages.**

NOTE: The INLINE II adapter will attempt to communicate with the J1939 datalink first. If no signal is present for the J1939 datalink, then INLINE II will attempt to communicate via J1587/J1708 datalink. Be sure that both INSITE™ and ESDN have the proper datalink adapter type selected.


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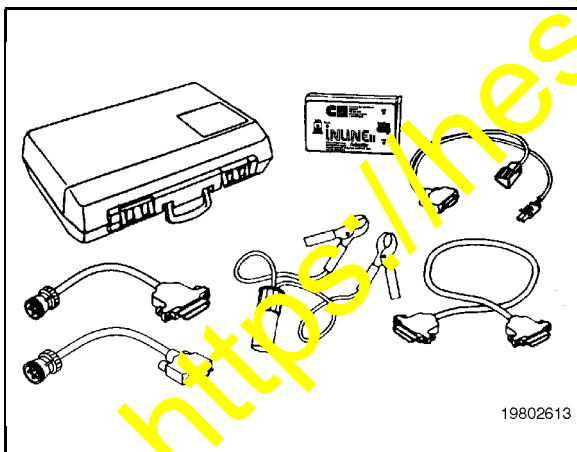
Komatsu's choice of datalink adapter is the INLINE II. Here are some of the INLINE II features:
• Communicates over two protocols: SAE J1587/J1708 standard and the emerging SAE J1939 standard.
• Supports the full range of Cummins electronically controlled engines.
• Has field-reprogrammable firmware for datalink adapter.

NOTE: INLINE communicates over one protocol **only**: the SAE J1587/J1708 heavy-duty standard. It supports the present vintage of heavy-duty engines, but will **not** support all future engines.

| Standard	INLINE II Adapter Kit Part No. 3163094
3163095	INLINE II datalink adapter DB9F-DB25M
3162848	Cable, D25F 9-pin Deutsch
3162847	Cable, DB25F 3-pin Deutsch/2-pin Weather-Pack
3162849	Cable, 2-pin Weather-Pack - cigarette plug extension
3162850	Cable, DB9F-DB9M 9-wire cable
3824438	Cable, DB25F 2-pin Weather-Pack - cigarette plug
3824439	Cable, DB25F 6-pin Deutsch
3163096	Adapter, J1939 minibackbone
3377728	INLINE brochure
3162866	Case, Cummins utility
3162867	Foam, insert 1-inch
3162868	Foam, insert 1/2-inch
3162867	Insert, storage case
3162868	Insert, storage case
3163597	Cable, 3-pin to 3-pin gender adapter
Optional	
3162851	Cable, 100 foot extension DB9F-DB9M
3162845	Cable, 200 foot extension DB9F-DB9M
3823955	Cable, battery adapter

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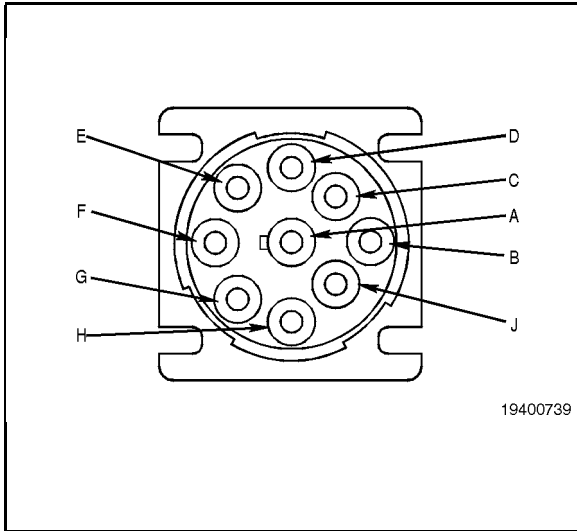
The recommended datalink connector for Cummins engines is a 9-pin Deutsch connector, Part No. 3824018. This connector can supply SAE J1587/J1708 and SAE J1939 communications, and the battery voltage. The following are pinouts for the 9-pin connector:

Pin	Signal	Pin	Signal
A	Ground	F	J1708 Datalink (+)
B	Unswitched Battery	G	J1708 Datalink (-)
C	J1939 Datalink (+)	H	Open
D	J1939 Datalink (-)	J	Open
E	J1939 Datalink (shield)		

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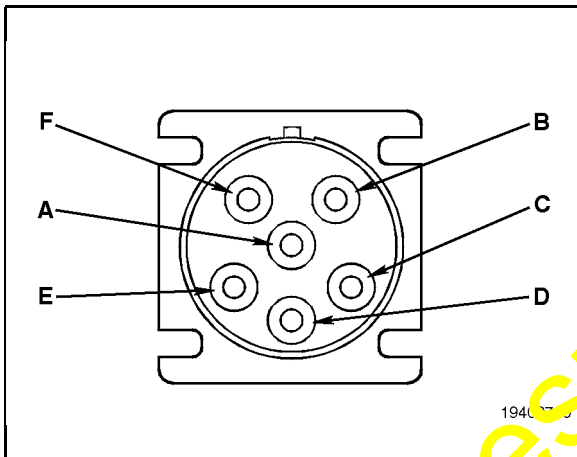
The 6-pin Deutsch connector, Part No. 3824805, is found on many engines. This connector supplies SAE J1587/SAE J1708, as well as the battery voltage. The following are pinouts for the 6-pin connector:

Pin	Signal	Pin	Signal
A	J1708 Datalink (+)	E	Ground
B	J1708 Datalink (-)	F	Open
C	Unswitched Battery (+)		
D	Open		

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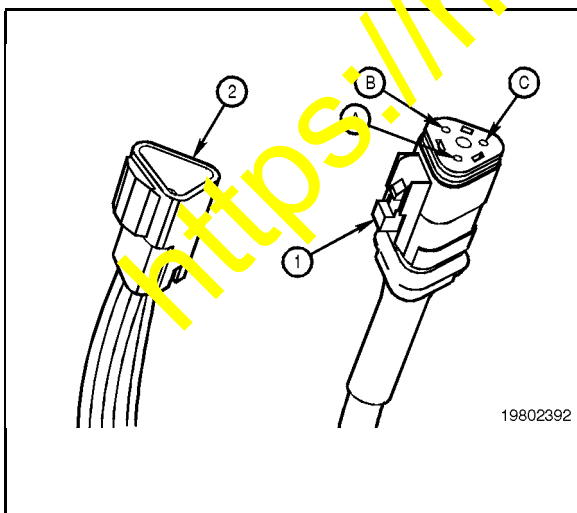
The 3-pin SAE J1939 Deutsch connectors are found on Komatsu SAA12V140Z-1 and Z-2 engines. Two possible types of 3-pin connectors can be present: A 3-pin plug (1), Part No. 3824288; and a 3-pin receptacle (2), Part No. 3284890. The 3-pin connectors **only** supply the SAE J1939 support (no battery voltage supply). The following are the pinouts for the 3-pin connector:

| Pin	Signal
A	J1939 Datalink (+)
B	J1939 Datalink (-)
C	J1939 Datalink (shield)

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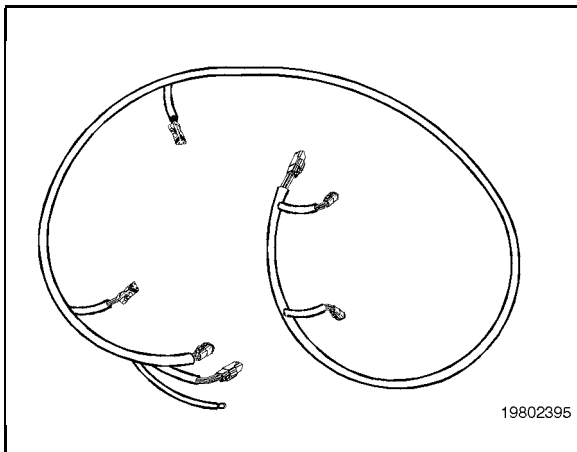
SAE J1939 Backbone Harness Overview
SAE J1939 has strict guidelines that **must** be followed for successful communication. Understanding some fundamentals about SAE J1939 will help make sure these guidelines are followed.

The main component of an SAE J1939 system is a backbone harness. The harness can be up to 40m (131 ft) in length. The backbone harness is terminated at each end with a 120-ohm resistor.

A maximum of 30 different devices can be attached to the SAE J1939 backbone at once. Each device, such as the INLINE II datalink adapter, is connected to the backbone through a stub, which can be up to 1 meter in length. The stub connector is a 3-pin plug.
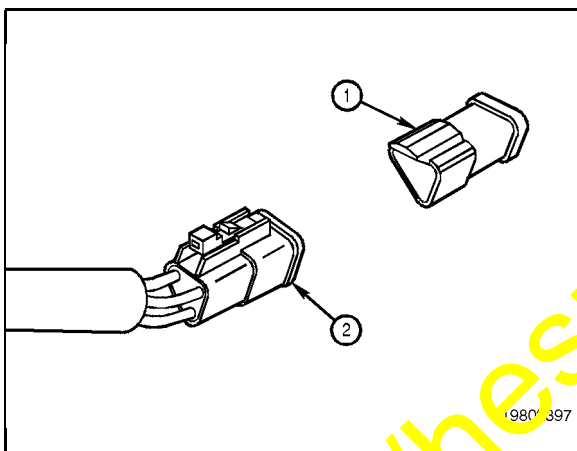
The terminating resistor caps (1) **must** be in place on the backbone harness plugs (2) to maintain proper communication. Each resistor is 120 ohms and located in a removable cap. This resistance is required when communicating with INSITE™ or ESDN over the J1939 datalink.
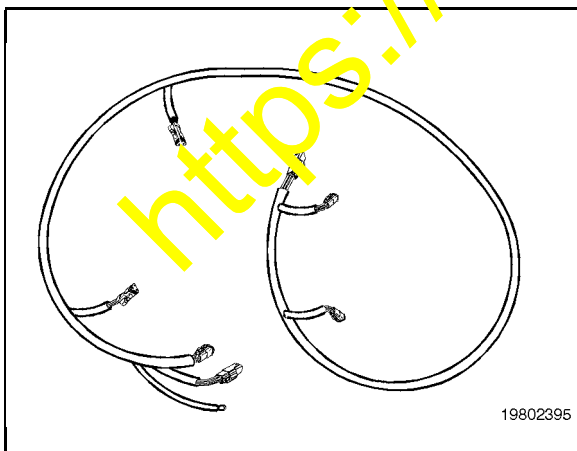
Often the OEM of a particular piece of equipment, not the engine manufacturer, supplies the datalink harnessing. Because of this, different levels of SAE J1939 implementation can be present.

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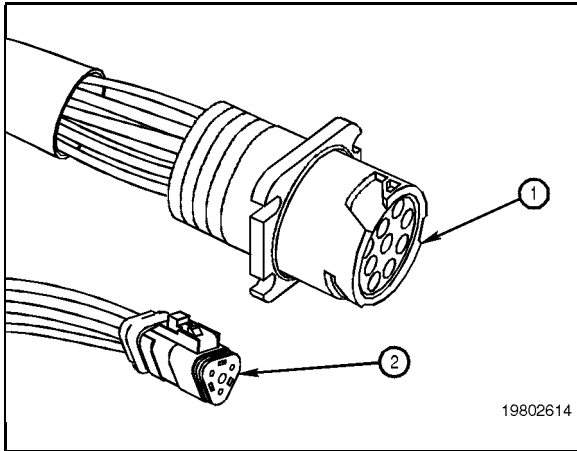
Some OEM's will choose to provide a complete SAE J1939 backbone harness. If this is supplied, connection to INSITE™ is accomplished either by a 9-pin datalink connector (1), Part No. 3824018, or a 3-pin plug (2), Part No. 3824288.


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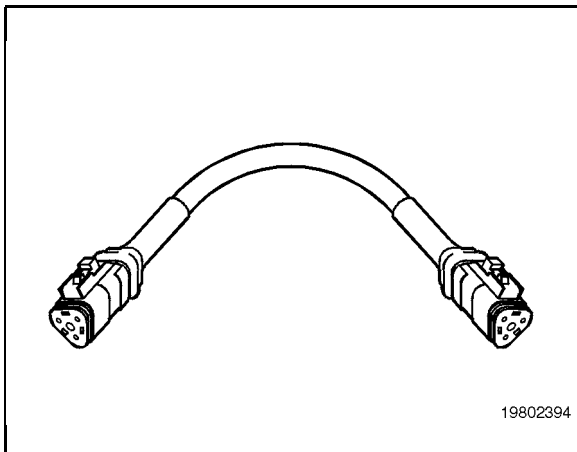
Minibackbone Harness, Part No. 3163096 - If the OEM does not supply the J1939 backbone harness, the only SAE J1939 connector on the engine will be the 6-pin receptacle, Part No. 3824290. To utilize SAE J1939 on engines with this configuration, a minibackbone harness will have to be added. The Cummins INLINE II adapter kit, Part No. 3163094, supplies a mini-backbone harness, Part No. 3163096.

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How to Connect to an ECM

This section is intended to be used as a step-by-step method for isolating the appropriate connection found in the vehicle. Find the bolded sentence that describes the applicable connection and then proceed with the instructions for that connection.

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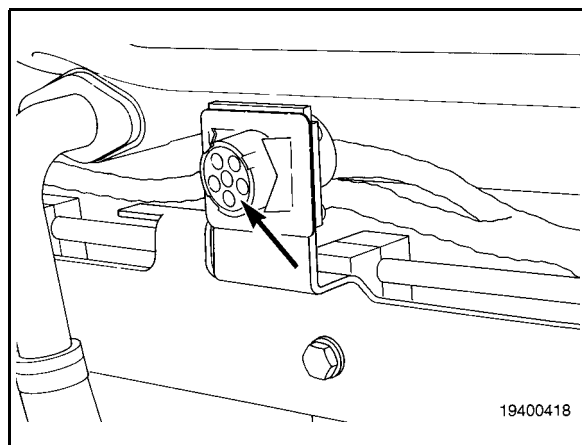
Look for a 6-pin connector in the cab of the vehicle or the side of the engine.
The 6-pin connector supports the SAE J1587/ J1708 datalink only. Use INLINE cable, Part No. 3824439 when connecting to the 6-pin connector.

An INLINE or an INLINE II datalink adapter can be used in conjunction with this connector. When connecting the INLINE II datalink adapter to the PC, use the 9-pin serial cable, Part No. 3162850, supplied with the INLINE II kit. This cable is connected between the PC and the datalink adapter.

NOTE: In order to use the INLINE II adapter for J1587/J1708 communications, INSITE™ version 5.1 or later **must** be used. Earlier versions of INSITE™/ESDN only allow J1939 datalink communication.

Select the appropriate settings in INSITE ™ to set the appropriate communication port and datalink adapter.

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Do you have an INLINE II datalink adapter?
If so, use the 9-pin serial cable, Part No. 3162850, supplied with the INLINE II kit. This cable is connected between the PC and the datalink adapter.

NOTE: In order to use the INLINE II adapter for J1587/J1708 communications, INSITE™ version 5.1 or later **must** be used. Earlier versions of INSITE™/ESDN only allow J1939 datalink communication.

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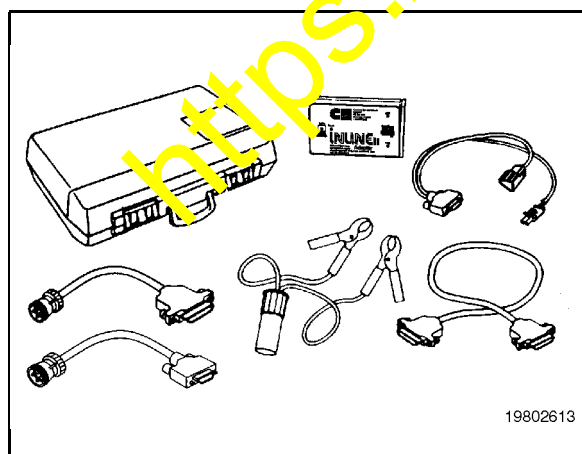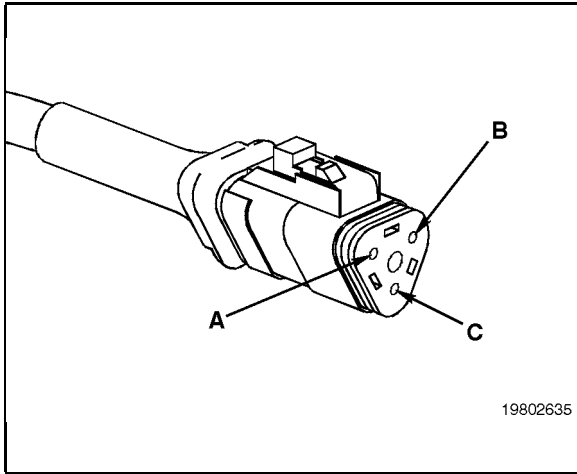
Look for a 3-pin connector on QST30 engines without a 9-pin connector. The 3-pin connector **only** supports the SAE J1939 datalink. Use the INLINE II cable, Part No. 3162847, when connecting to the 3-pin plug connector.

A J1939 backbone harness is present on the system when a resistance of 60 ohms is measured between pins A and B of the 3-pin connector.

Refer to the SAE J1939 overview section above to learn about the J1939 backbone harness.

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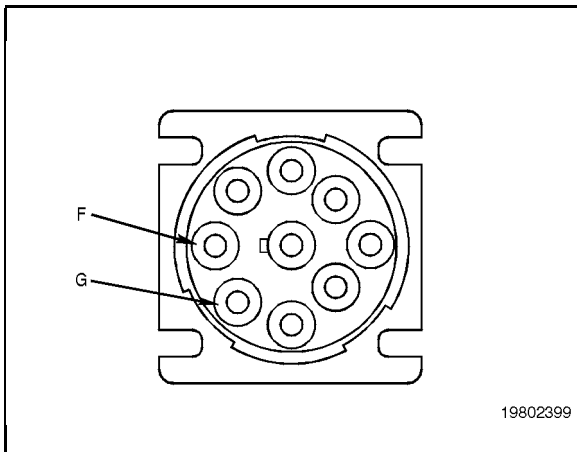
Do you have only an INLINE datalink adapter? The INLINE datalink adapter communicates **only** with the J1587/J1708 datalink. To use the INLINE datalink adapter with the 9-pin datalink connector, pins F and G should be populated. If pins F and G are not populated and an appropriate datalink connector can not be found on the engine, then purchase the INLINE II datalink adapter kit (Part No. 3163094) for communication.
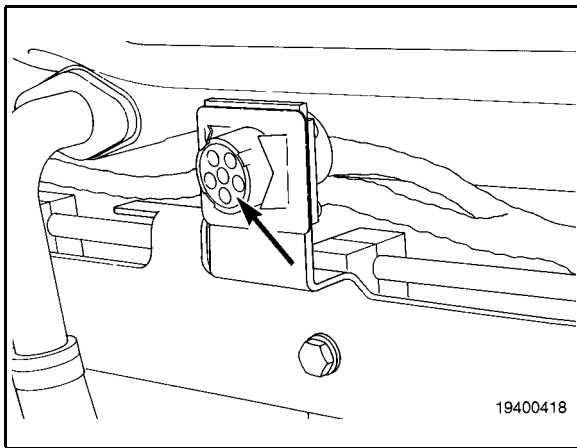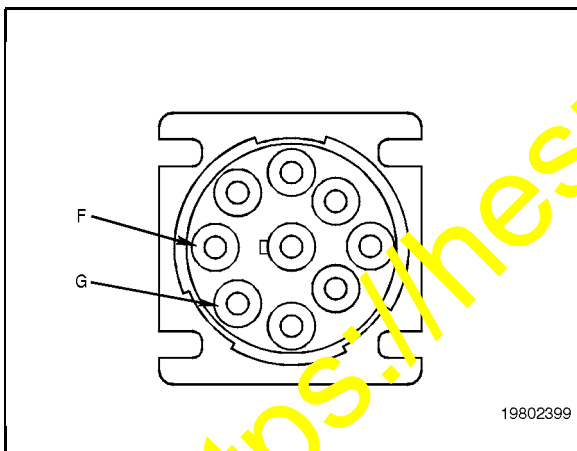
The 6-pin connector only supports the SAE J1587/J1708 datalink. Use INLINE cable, Part No. 3824439, when connecting to the 6-pin connector.

An INLINE or an INLINE II datalink adapter can be used in conjunction with this connector. When connecting the INLINE II datalink adapter to the PC, use the 9-pin serial cable, Part No. 3162850, supplied with the INLINE II kit. This cable is connected between the PC and the datalink adapter.

NOTE: In order to use the INLINE II adapter for J1587/J1708 communication, INSITE™ version 5.1 or later **must** be used. Earlier versions of INSITE™/ESDN only allow J1939 datalink communication.

Select the appropriate settings in INSITE™ to set the appropriate communication port and datalink adapter.

The 3-pin connector **only** supports the SAE J1939 datalink.
To meet the SAE J1939 standard, the 3-pin receptacle connector must be within 0.66m (2.16 ft) of the ECM. Use of a J1939 minibackbone harness, Part No. 3163096 and the DB25F 3-pin Deutsch, part No. 3162847, are required for proper connection to the INLINE II adapter. This is used when there is no backbone provided on the datalink.

NOTE: If there is 60-ohm resistance measured between pins A and B of the 3-pin connector, then a backbone is on the datalink.

Refer to the SAE J1939 backbone harness overview section above to learn about the J1939 mini-backbone harness.